

The Interaction of Contrastive Stress and Grammatical Context in Child English Speakers'

Interpretations of Existential Quantifiers

A Senior Thesis

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Abstract

Scalar implicatures, such as the “some, but not all” implicature associated with the existential quantifier “some”, are systematically canceled in downward entailing (DE) environments, such as the antecedent clause of a conditional sentence (cf. Ladusaw 1979). We observe, however, that this no-implicature “some” must be prosodically de-accented. This contrasts with the *SOME* used with implicatures which must carry a L+H* pitch accent. Further, pitch-accented *SOME* is more associated with implicatures than is the de-accented version of *some*. The vowel-reduced *sm* (cf. Postal 1964, Milsark 1977) is more associated with the pure existential, no-implicature interpretation than is the prosodically de-accented, but full-vowel version of *some*. Further, pitch-accented *SOME* appears rarely without an implicature, and vowel-reduced, de-accented *sm* may not associate with an implicature.

Given the apparent importance of vowel duration and pitch accent for implicature generation, we investigate child English speakers’ awareness of them. Guasti et al (2005) shows that 7 year-old Italian-speaking children generate implicatures with the Italian version of *some*. Similarly, Chierchia et al (1998) show that child English and child Italian speakers both compute and cancel implicatures associated with English and Italian *some*. Papafragou & Tantalou (2004) also show that child Greek speakers compute the implicature associated with Greek *some*, which must be accompanied by contrastive stress. However, the importance of prosodic and segmental properties for implicature generation and cancellation in child English have not been addressed.

We predict 1) that if pitch accent is crucial to computing an implicature, children should generate an implicature with pitch-accented *SOME*, not only in non-DE environments, but also in DE environments, 2) if vowel reduction is crucial to implicature cancellation, then *sm* should allow more implicature cancellation than deaccented *some* and 3) if the presence/absence of

pitch accent is crucial to implicature cancellation, then deaccented *some* should allow more implicature cancellation than pitch-accented *SOME*.

Using a between-subjects design with six groups (3 groups of adults, $n=51$; and 3 groups of children, $n=40$, age range=3;8-5;8, mean age=4;5), we tested our 3 predictions using a video-recorded Truth Value Judgment Task. Regarding prediction 1, adults generated implicatures with pitch-accented *SOME* in both DE and non-DE environments - more than with either *sm* ($\chi^2=4.37$, $p=.037$) or *some* ($\chi^2=11.6$, $p=.001$). Children generated implicatures with pitch-accented *SOME* in DE contexts more than with deaccented *some* ($\chi^2=7.17$, $p=.007$). This was not true in non-DE contexts. For prediction 2, adults allowed significantly more implicature cancellation with *sm* than with deaccented *some* in non-DE contexts ($\chi^2=4.37$, $p=.037$), but not in DE contexts, confirming that DE environments cancel implicatures in the absence of pitch accent. The same results were significant for children in both non-DE contexts ($\chi^2=5.6$, $p=.018$) and DE contexts ($\chi^2=16.9$, $p<.0001$). For prediction 3, adults allowed more implicature cancellation with deaccented *some* than with pitch accented *SOME* in both non-DE ($\chi^2=11.6$, $p<.001$) and DE contexts ($\chi^2=18.5$, $p<.0001$), confirming the importance of pitch accent in implicature cancellation. The same was true for children, but only in DE contexts ($\chi^2=7.17$, $p=.007$).

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Chapter 1 - Background

1.1 Introduction

Implicature generation is a complex component of speech, with both grammatical and pragmatic dimensions. Implicature generation and cancellation with existential quantifiers such as *some* have been studied extensively both in adult and child English. However, the influences of vowel reduction and contrastive stress (pitch accent) in the creation of pragmatic implicatures associated with *some* have never been explicitly controlled for. The examination of the role of vowel reduction and pitch accent in the creation and cancellation of pragmatic implicatures in English may give us a clearer understanding of the role of grammatical context and intonation, and how these two concepts interact to create or cancel pragmatic implicatures.

The goal of this study is to show that both vowel reduction and pitch accent are essential to the creation and cancellation of pragmatic implicatures in English.

1.2 Existential Quantifiers in Adult English

In adult English, there are three variants of the existential quantifier *some* which will be investigated in this thesis. One, spelled *sm* to indicate its reduced vowel, only allows an existential or “logical” interpretation. A second, spelled *SOME* to indicate that it has a L+H* pitch accent, can only have a pragmatically enriched “some, but not all” meaning, and a third, spelled *some* to indicate its ambiguous status, may have either the logical or the pragmatically enriched meaning as a function of grammatical and discourse context.

Milsark first noted two classes of determiners: “weak” and “strong”. *Sm* is included as a weak determiner, along with “a” and number determiners. Strong determiners include “definites”, “the”, and universals (such as all, every, each, etc.), among others. *Sm* can be included in the class of number determiners, with the distinction between it and other members

of this class being a greater degree of vagueness. Nonuniversal determiners and *sm* can be freely substituted, as they carry the same meaning.

An important distinction must be made between two different types of *some* (first noted by Postal). The first type of *some* (referred to as “sm” by Postal) carries a purely existential reading, as in (1).

(1) Sm people got on the bus.

In this sentence, nothing is stated beyond the fact that an unspecified (and probably not large) number of people got on the bus. The same sentence with the second meaning of *some* has an entirely different meaning, as in (2).

(2) Some people got on the bus.

This reading of *some* states that of the class of people, a certain subset of those people got on the bus. This reading implies that there is a separate group of people who did not get on the bus. The meaning of *some* in this case can be taken to be “some, but not others”. This pragmatically enriched meaning of the sentence in (2) may carry nearly the same meaning as (3).

(3) Some of the people got on the bus.

The sentence in (3) is also pragmatically enriched by a quantity implicature associated with the *some* quantifier, but the presence of the partitive prepositional phrase “of the people” makes the

partitivity of the noun phrase unambiguous and the definiteness presupposition associated with the definite description “the people” presupposes that the speaker believes that there is a salient group of people in the conversational common ground.

Postal states that the reading of “some, but not others” can be reinforced by stressing the item *some*, but that the presence of that stress is not a perfect test for the *sm/some* distinction. In general, “sm” does not carry any accent at all. In addition, Milsark states that substitutability of “some of the” can be a reliable test that the reading is “some”, but not the reverse. This is because the presence of “the” indicates a limitation of the set, leading to the “some, but not others” reading of *some*. The “sm” meaning of *some* classes with weak determiners, while the “some” reading of *some* classes with strong determiners.

Chierchia proposes that the interpretation of logical words such as determiners results from an interaction between semantics and pragmatics. In situations where the outcome is known, semantics determines the interpretation of the logical word, while in situations where the outcome is uncertain, pragmatics prevails.

Horn (1972) proposed that logical words can form a scale. Scalar implicatures work by placing statements against a background of alternatives within the same scale that differ only in the amount of information they contain. By choosing a sentence containing a scalar term, the speaker implies the negation of all sentences containing a stronger scalar term. Scalar implicatures do not occur in downward-entailing linguistic environments such as the antecedent of a conditional or in a situation that involves doubt.

Grammar provides two possible meanings for each sentence containing a scalar term, and a speaker will usually choose to use the strongest interpretation that is compatible with the context. Chierchia (2001) showed that adults are able to discern a difference in these interpretations of

logical words in downward-entailing vs. non-downward-entailing contexts. In addition, once adults have developed the ability to create implicatures in these environments, some individuals develop the ability to inhibit that implicature in favor of a logical interpretation of the quantifier (Feeney, 2004).

In all of this work, however, there has been a consistent lack of attention to the role of phonological properties, including segmental properties such as vowel duration, as well as prosodic properties such as pitch accent. According to the observations I have made, detailed below, both of spontaneous speech and experimental results, both pitch accent and vowel duration are critical variables for the computation and cancellation of pragmatic implicatures in English. In particular, vowel reduction and the absence of pitch accent seem to associate with the pure existential or logical interpretation of the quantifier *some*, while the presence and elongation of vowel duration and the presence of a L+H* pitch accent seem to associate with the pragmatically enriched “some, but not all” interpretation of *some*. The middle case, which has a full vowel, but no pitch accent, seems more amenable to the effects of grammatical and discourse context, independent of phonological properties.

1.3 – Existential Quantifiers in Child English

Previous research (Noveck, 2001; Papafragou & Musolino, 2003) has argued that there are two stages to implicature processing. In the first stage, children are unable to compute scalar implicatures. In the second stage, the ability to compute implicatures emerges. Feeney et.al. propose the addition of a third stage of processing, in which some adults prefer the logical definition of the quantifier, even though they are capable of computing the scalar implicature. In their research, Feeney et.al. found that some adults did not compute the implicatures, some

consistently computed the implicature, and some computed the implicature, but ignored it in favor of a logical interpretation of the quantifier. In this work, as in virtually all of the works to be summarized, the phonological properties of these quantifiers have been ignored.

In general, research has suggested that children tend to be more logical than adults, with a tendency to interpret “some” as “all” much more frequently than adults. This tendency may be a result of several factors. Noveck (2001) proposes that the differences in implicature interpretation between adults and children may be a result of added strain on language processing capabilities due to the addition of a scalar meaning.

Previous studies (Noveck, 2001, Guasti et.al. 2005) have shown that children as young as 7 are able to compute implicatures, provided that the conversational background of the experiment is natural. However, even with explicit training items, children in this experiment failed to compute implicatures as reliably as adults. Papafragou and Musolino (2003) also found that children were not as likely as adults to compute implicatures associated with “some”. However, even within these two studies, the response rates of adults differed, with 43% of adults failing to compute implicatures in the Noveck study, while 93% of adults in the Papafragou and Musolino study reliably computing implicatures. These results indicate that adults are also incapable of computing implicatures under certain grammatical conditions.

Guasti found that awareness that statements can differ in the amount of information they provide is relevant for the computation of implicatures in children. Additionally, the activation of the scale that includes “some” is needed (the scale that includes “some” also includes “all”). In previous experiments, the subjects were left to create their own relevant backdrop to the information provided. Guasti notes that this aspect of the experiments makes it impossible to determine the derivation of implicatures computed during the study. However, when context is

clearly defined, children have been shown to be capable of computing implicatures much earlier than previously thought – even as young as 4, 5, and 6 years old (Papafragou & Tantalou, 2004).

Papafragou & Tantalou showed that children are capable of computing scalar implicatures when their expectations of informativeness for the conversation are not met by the speaker. When justifying negative responses to experimental tasks, participants in this study regularly referenced stronger alternatives to the scalar item used. Papafragou & Tantalou mention in passing that they only used the Greek existential quantifier with contrastive stress. This is the sole reference to the influence of phonological properties found in the child literature.

While syntactic considerations in the production and cancellation of scalar implicatures have been extensively researched, relatively unstudied is the role of intonation in the development of children's ability to compute and cancel scalar implicatures. It seems that intonation does not play a major role in Spanish (Vargas-Tokuda, Personal communication). However, it seems to be critical in English in order to distinguish among at least three different uses of the existential quantifier *some*.

There are two basic ways in which to analyze contrastive stress in English – in terms of phonological properties, and also in terms of semantico-pragmatic focus. Native English speakers can easily determine which prosodic tunes are felicitous in a given context, and are also able to derive implicatures from prosodic accents.

In English, pitch accents are used to focus particular constituents of an utterance in order to encode information about presupposition. A pitch accent marks a word's lexically stressed syllable, is tonally different from surrounding syllables, and often differs from other syllables in amplitude and length. In this way, the pitch accent marks new information. The ToBI (Tones and Break Indices) notation system describes five possible pitch accents for English (Beckman

and Ayers, 1997). The tone most relevant to this study is the L+H* tone, which is traditionally taken to mark contrastive stress or contrast. In fact, a L+H* accent can only be placed on an item that indicates contrastive information.

Cutler and Swinney (1987) established that elementary school aged children can reliably distinguish between stressed and unstressed words, but that younger children between the ages of 4;0 and 6;0 do not have the same ability. Although younger children are able to distinguish between stressed and unstressed words in the absence of sentence processing, they were unable to demonstrate this ability while doing sentence processing work. However, this experiment did not show whether or not children were able to use information about word stress while performing other linguistic tasks. Ross (2008) states that the many tasks we perform by using contrastive stress cues are not necessarily all equal in determining whether children can distinguish and utilize contrastive stress, and that results from these types of studies cannot be generalized to determine whether or not children can use contrastive stress to complete linguistic tasks.

The results of Ross' (2008) study indicate that acquisition of prosodic contrast comprehension is not a discrete event in language development, but rather a continuum. In addition, this study implies that a contrastive stress pitch contour provides the meaning "some set of information is presupposed", rather than "the focused item is subject to contrast".

This study hopes to show that prosodic accent plays a role both in the generation and cancellation of scalar implicatures on the word *some* through the creation of three tonally distinct types of *some*: *sm*, *some* (non-pitch accented), and *some* (L+H* pitch accent, hereafter referred to as *SOME*).

The unstressed and phonologically reduced version of the quantifier *some* in 5a is purely existential, in that it does not intend to relate the group of students which is coming to any other set of students that may be discussed. The same meaning holds true for the phonologically unstressed, but not reduced, version in 5b. However, in 5c contrastive stress on the quantifier indicates that the speaker is thinking of a certain group of students, and that only a subset of them will be coming to the office.

5. Intonationally Distinguished Uses of *some*

- a. Sm students are coming to my office
- b. Some students are coming to my office
- c. SOME students are coming to my office (*but not others*)

The first two versions of *some* can be felicitously used in adult English in a downward-entailing environment, with the result that the “some, but not all” implicature is cancelled, as in 6a and 6b. However, in 6c the implicature is not cancelled if *some* is pronounced with contrastive stress.

6. *some* in Downward Entailing Environments

- a. If sm students come to my office, you owe me lunch.
- b. If some students come to my office, you owe me lunch
- c. If SOME students come to my office, you owe me lunch

The duration of the implicature in 6c demonstrates that while grammatical context is important for computing implicatures, it interacts with other linguistic factors, including phonological contrastive stress.

This is relevant to child language development because while child English speakers have been shown to compute and cancel scalar implicatures, this variable has never been explicitly controlled for. Of course the contrast that must have been used to derive the published results is between the type of sentences used in 5a or b. versus the type used in 5c. This is particularly interesting because there are mixed results as to child English speakers' ability to use contrastive stress to make pragmatic judgments (Cutler & Swinney 1987, Cruttenden 1984, Peppe & Goulondris 2004, Patterson, Liversedge, Filik, & Jaz 2005, McDaniel and Maxfield 1992).

There are multiple debates, then, to which this study relates. First, what role do phonological properties play in the generation and cancellation of pragmatic implicatures in adult English? In particular, does vowel reduction associate with implicature cancellation and does the presence of a pitch accent associate with implicature generation? Next, if phonological properties are crucial to these semantic distinctions in adult English, are child English speakers able to generate and cancel pragmatic implicatures when these properties are systematically controlled, given that existing studies have not done so? In particular, given the predominant position (cf. Cutler & Swinney 1987) that children are delayed until roughly 6 years of age in developing comprehension of semantically important prosodic distinctions, can 4 year-old English speaking children make use of prosodic, grammatical and pragmatic context to generate and cancel pragmatic implicatures as do adults?

2.0 Experiment 1: Adult Use of Existential Quantifiers in Spontaneous Production

Before determining the role of vowel reduction and pitch accent in the generation and cancellation of implicatures, it was important to confirm that all three types of *some* (*sm*, *some*, & *SOME*) are used by adults in spontaneous speech.

2.1 Methods

To determine the frequency of use of each of these types of *some*, 14 hours of talk radio (programs include Fresh Air, Science Talk, & Talk of the Nation (90.5FM), Mix Morning Show (97.1FM), the Bryant Park Project, and National Geographic World Talk) was analyzed for spontaneous production of *some*. Each utterance was classified by some type, and by the speaker's intended meaning (existential or implicature) inferred from context. The results are summarized in table 1.

2.2 Results

	<i>Some Type</i>		
	<i>sm</i>	<i>some</i>	<i>SOME</i>
# of Utterances	22	41	19

Table 1 – Spontaneous Production of Existential Quantifier Variants

There were a total of 82 utterances. In general L+H* *SOME* was used with an implicature meaning of “some, but not all”, while deaccented *some* and *sm* were generally used in an existential sense, when the speaker was referring to an unspecified set, or speaking in very general terms.

2.3 Discussion

As we can see in Table 1, the prevalence of *sm* and *some* (both variants used primarily in an existential sense) was much greater than the prevalence of *SOME* (used primarily with the pragmatically enriched implicature meaning of “some, but not all”). However, all three variants were present in adult spontaneous speech.

Although deaccented *some* primarily carried an existential meaning, it was occasionally also used with an implicature meaning. This suggests a degree of ambiguity associated with *some* in the absence of a phonological marker such as vowel reduction or pitch accent.

3.0 Experiment 2: Implicatures in Adult English Existential Quantifier Use

The purpose of experiment 2 was to determine the role of vowel reduction and pitch accent in the generation and cancellation of implicatures in adult English. Under the assumption, suggested by the results of experiment 1, that both vowel reduction and pitch accent are important variables for implicature generation, the following 3 predictions will be investigated:

Prediction 1: If pitch accent is crucial to computing an implicature, adults should generate an implicature with pitch-accented *SOME*, not only in the non-DE environment, but also in the DE environment.

Prediction 2: If vowel reduction is crucial to implicature cancellation, then *sm* should allow more implicature cancellation than deaccented *some*.

Prediction 3: If the presence/absence of a pitch accent is crucial to implicature cancellation, the deaccented *some* should allow more implicature cancellation than pitch-accented *SOME*.

3.1 Methods

Participants. 51 English-speaking adults (age range = 19;0 - 63;11 mean age = 26;4) from Columbus, Ohio participated in this study. Adults were required to pass both control sentences to be included in the study. One adult failed to pass both control sentences and was excluded from the study.

Materials. Videos were recorded with (type of camera goes here). Participants watched the videos on a MacBook laptop while wearing Sony MDR-NC7 Noise Canceling Headphones. Scenarios were performed using a lion puppet, a panda puppet, a barn, a fence, and 8 sets of plastic animals.

Procedures. We used a Truth Value Judgment Task (Crain & McKee 1985) in a completely between subjects design. For sentences appearing in a non-downward-entailing environment, adults were asked to judge whether “Sam” (the lion puppet) had correctly described what he had observed in the barnyard. For sentences appearing in a downward-entailing environment, “Sam” and “Bill” (the panda puppet) placed bets on what would happen in the barnyard. Adults were asked to judge who had won the bet.

Stimuli. There were four target sentences with either 3 or 4 of 4 animals jumping over a fence. Two of the four target sentences appeared in a downward-entailing environment (the antecedent of a conditional). There were two control sentences with either 0 of 4 or 3 of 4 animals jumping over a fence, utilizing the words “all” and “none”. Additionally, there were two training

sentences with 4 of 4 or 3 of 4 animals jumping over the fence, also using the words “all” or “none”. Each set of participants was shown a video containing a single version of *some*¹.

Example script for non-DE context:

Experimenter: This is Sam (introduce lion puppet). Sam loves to play games. His favorite game to play is the barnyard game. Sam is going to watch what goes on in the barnyard, and in the end, tell you what he sees. Your job is to tell me if what Sam said was right. Let's watch!

Experimenter moves 3 of 4 or 4 of 4 animals to jump over the fence towards the barn.

Sam: I know what happened! Sm cats jumped over the fence!

Experimenter: Is that right?

Example script for DE context:

Experimenter: Now we're going to play a new game with Sam (indicate lion puppet) and Bill (introduce panda puppet). Sam and Bill love to watch what goes on in the barnyard and tell you what they see. In the end, you get to decide who's right. Let's watch!

Sam: Let's play a game!

Bill: OK

Sam: This time, if sm cats jump over the fence, you have to give me a quarter!

Bill: OK!

Experimenter moves 3 of 4 or 4 of 4 cats to jump over the fence towards the barn.

Sam: Now you have to give me a quarter!

Bill: No I don't.

¹ Many thanks to Sharon Ross for her insight and invaluable help in the creation of this experimental design.

Sam: Yes you do! I said, if sm cats jump over the fence, you have to give me a quarter!

Experimenter: What do you think? Should Bill give Sam a quarter?

Training sentences:

(6) All of the donkeys jumped over the fence (4 of 4 jump)

(7) None of the roosters jumped over the fence (3 of 4 jump)

Control Sentences

(8) None of the cows jumped over the fence (0 of 4 jump)

(9) If All of the zebras jump over the fence, you have to give me a quarter (3 of 4 jump)

Target Sentences

(10) Sm/Some/SOME monkeys jumped over the fence (3 of 4 jump)

(11) Sm/Some/SOME cats jumped over the fence (4 of 4 jump)

(12) If sm/some/SOME pigs jump over the fence, you have to give me a quarter (3 of 4 jump)

(13) If sm/some/SOME elephants jump over the fence, you have to give me a quarter (4 of 4 jump)

In each video, the target sentences used the same scenario and animal type, with the only difference being the type of *some* used in the sentence (sm/some/SOME).

Each target sentence was analyzed for word duration, vowel duration, and maximum pitch.

The mean measurements of these variables for the four stimuli of each type are given in Table 2.

Some type	Word Duration (s)	Vowel Duration (s)	Maximum Pitch (Hz)
sm	0.301	n/a	297.7

some	0.350	0.139	273.2
SOME	0.398	0.154	471.2

Table 2 – Duration and Pitch Properties of Existential Quantifier Stimuli

Additionally, each sentence was ToBi transcribed to ensure that correct intonational patterns were achieved for each utterance. Examples for each type of *some* are provided here. For a complete list, see Appendix A.

Fig.1 Sm cats jumped over the fence

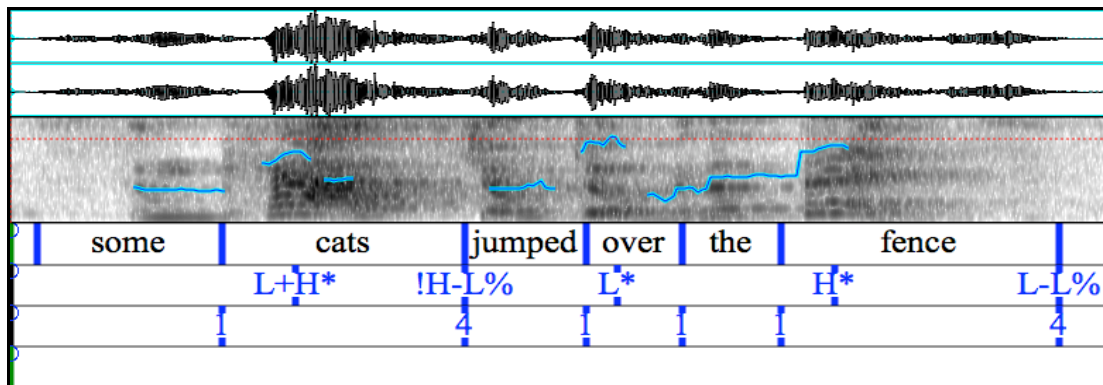


Fig. 2 Some cats jumped over the fence

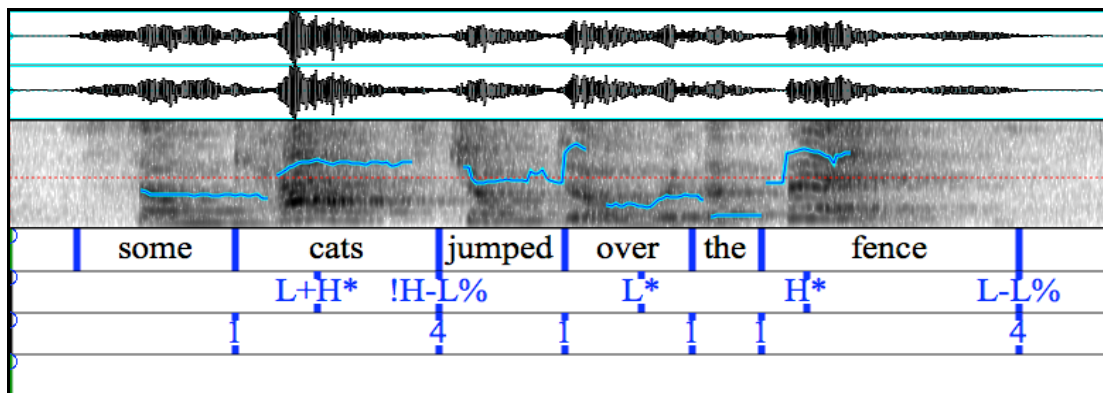
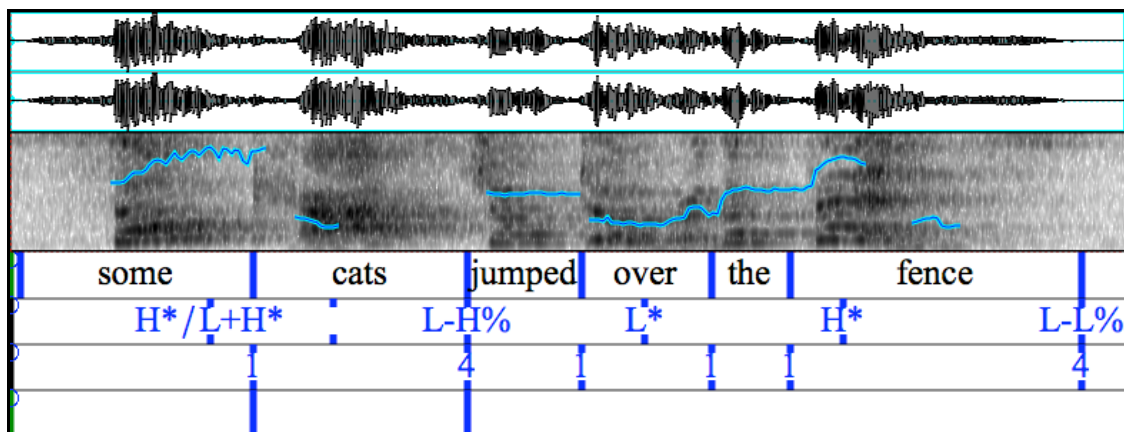


Fig.3 SOME cats jumped over the fence



Significant differences in pitch were found between SOME and some ($p < .000$) and between SOME and sm ($p = .001$) by paired t-test. Additionally, significant differences in vowel duration were found between SOME and some ($p < .000$) by paired t-test. Differences in word duration were found between SOME and sm ($p = .033$), also by paired t-test.

3.2 Results

Percentage of Responses when 4/4 Animals Jumped in non-DE Context					
sm (n=11)		some (n=22)		SOME (n=17)	
Accept	Reject	Accept	Reject	Accept	Reject
73%	27%	59%	41%	35%	65%
8/11	3/11	13/22	9/22	6/17	11/17

Table 3 – Adult Judgments of Implicature Generation with Each Quantifier in Non-Downward Entailing Contexts With 4 of 4 Animals Under Consideration Jumping

Percentage of Responses when 4/4 Animals Jumped in DE Context					
sm (n=11)		some (n=22)		SOME (n=17)	
Accept	Reject	Accept	Reject	Accept	Reject
82%	18%	91%	9%	66%	34%
9/11	2/11	20/22	2/22	13/17	4/17

Table 4 – Adult Judgments of Implicature Generation with Each Quantifier in Downward Entailing Contexts With 4 of 4 Animals Under Consideration Jumping

3.3 Discussion

Considering Tables 3 and 4, we see that with respect to prediction 1, implicatures with pitch-accented SOME were generated not only in non-DE environments, but also in DE environments. In fact, they were generated significantly more than with either *sm* ($\chi^2 = 4.37$ d.f. = 1 $p = .037$) or *some* ($\chi^2 = 11.6$ d.f. = 1 $p = .001$).

Prediction 2 was also confirmed. *Sm* allowed significantly more implicature cancellation than deaccented *some* in non-DE context ($\chi^2 = 4.37$ d.f. = 1 $p = .037$). No difference was found in DE context ($\chi^2 = 3.47$ d.f. = 1 $p = .063$), confirming that DE environments cancel implicatures in the absence of a pitch accent.

Deaccented *some* allowed more implicature cancellation than pitch accented SOME in both non-DE context ($\chi^2 = 11.6$ d.f. = 1 $p < .001$) and in DE context ($\chi^2 = 18.5$ d.f. = 1 $p < .0001$), confirming the importance of pitch accent in implicature cancellation.

4.0 Experiment 3: Implicatures in Child English Existential Quantifier Use

The purpose of this experiment was to determine the importance of vowel reduction and pitch accent in the generation and cancellation of implicatures in child English. Under the assumption,

suggested by the results of experiments 1 & 2, that both vowel reduction and pitch accent are important variables for implicature generation, the following 3 predictions will be investigated:

Prediction 1 If pitch accent is crucial to computing an implicature, children should generate an implicature with pitch-accented some, not only in the non-DE environment, but also in the DE environment

Prediction 2 If vowel reduction is crucial to implicature cancellation, then sm should allow more implicature cancellation than deaccented some.

Prediction 3 If the presence/absence of pitch accent is crucial to implicature cancellation, then deaccented some should allow more implicature cancellation than pitch-accented some.

4.1 Methods

Participants. 40 monolingual, English-speaking children (age range = 3;8 – 5;8 mean age = 4;5) from a daycare in Columbus, Ohio participated in this study. Children were required to pass at least one control sentence to be included in the study. Eight children failed to pass at least one filler and were excluded from the study.

Materials. Videos were recorded with (type of camera goes here). Participants watched the videos on a MacBook laptop while wearing Sony MDR-NC7 Noise Canceling Headphones. Scenarios were performed using a lion puppet, a panda puppet, a barn, a fence, and 8 sets of plastic animals.

Procedures. We used a Truth Value Judgment Task (Crain & McKee 1985) in a completely between subjects design. Children were told that “Sam” (the lion puppet) was still a baby and just learning to talk. Children were asked to help Sam know if what he said was correct or not. For sentences appearing in a non-downward-entailing environment, children were asked to judge whether “Sam” had correctly described what he had observed in the barnyard. For sentences appearing in a downward-entailing environment, “Sam” and “Bill” (the panda puppet) placed bets on what would happen in the barnyard. Children were asked to decide who had won the bet by determining whether the animal placing the bet had correctly described what he had observed in the barnyard.

Stimuli. The stimuli for this experiment were identical to those used in experiment 2.

4.2 Results

Percentage of Responses when 4/4 Animals Jumped in non-DE Context					
sm (n=8)		some (n=8)		SOME (n=16)	
Accept	Reject	Accept	Reject	Accept	Reject
88%	12%	75%	25%	69%	31%
7/8	1/8	6/8	2/8	11/16	5/16

Table 5 – Children’s Judgments of Implicature Generation with Each Quantifier in Non-Downward Entailing Contexts With 4 of 4 Animals Under Consideration Jumping

Percentage of Responses when 4/4 Animals Jumped in DE Context					
sm (n=8)		some (n=8)		SOME (n=16)	
Accept	Reject	Accept	Reject	Accept	Reject
63%	37%	88%	12%	73%	27%
5/8	3/8	7/8	1/8	10/16	6/16

Table 6 – Children’s Judgments of Implicature Generation with Each Quantifier in Downward Entailing Contexts With 4 of 4 Animals Under Consideration Jumping

Prediction 1 is partially confirmed. Children generated implicatures with pitch-accented SOME in DE context more than with deaccented *some* ($\chi^2 = 7.17$ d.f. = 1 $p=.007$). However, in non-DE context, although the percentage of implicature generation is higher with pitch-accented SOME than with deaccented *some*, it did not rise to the level of statistical significance ($\chi^2 = .893$ d.f. = 1 $p = .345$).

Prediction 2 was confirmed. *Sm* allowed significantly more implicature cancellation than deaccented *some* in both non-DE context ($\chi^2 = 5.6$ d.f. = 1 $p = .018$) and DE context ($\chi^2 = 16.9$ d.f. = 1 $p < .0001$).

Prediction 3 was also confirmed. Deaccented *some* allowed more implicature cancellation than pitch-accented SOME in DE context ($\chi^2 = 7.17$ d.f. = 1 $p = .007$).

4.3 Discussion

Sample size is small. However, 1/3 of both adults and children were willing to create an implicature in DE grammatical context with pitch-accented SOME, which suggests the importance of pitch accent in the generation of implicatures in English. Previous research established that elementary school aged children are capable of distinguishing stressed and

unstressed words, but suggested that younger children (4;0-6;0) were not capable of doing so while simultaneously doing sentence processing. In addition, previous research has provided mixed results regarding childrens' ability to use contrastive stress to make pragmatic judgments.

The children in this study (mean age 4;6) were capable of distinguishing between deaccented *some* and pitch-accented SOME, and of using that distinction to cancel implicatures in DE context. This contradicts previous research by suggesting that children younger than 7 are capable of generating and canceling pragmatic implicatures when both grammatical context and intonation are controlled for, and suggests that young children are capable of using contrastive stress to make this type of pragmatic judgment.

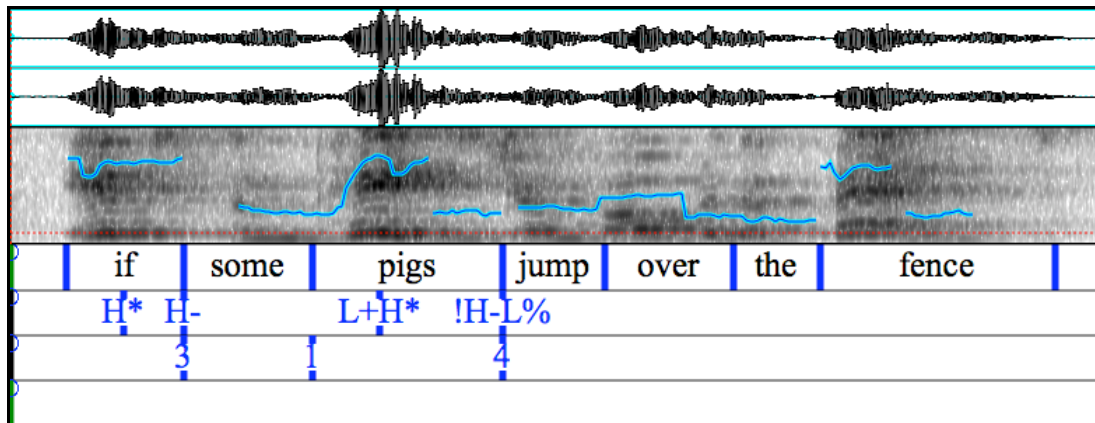
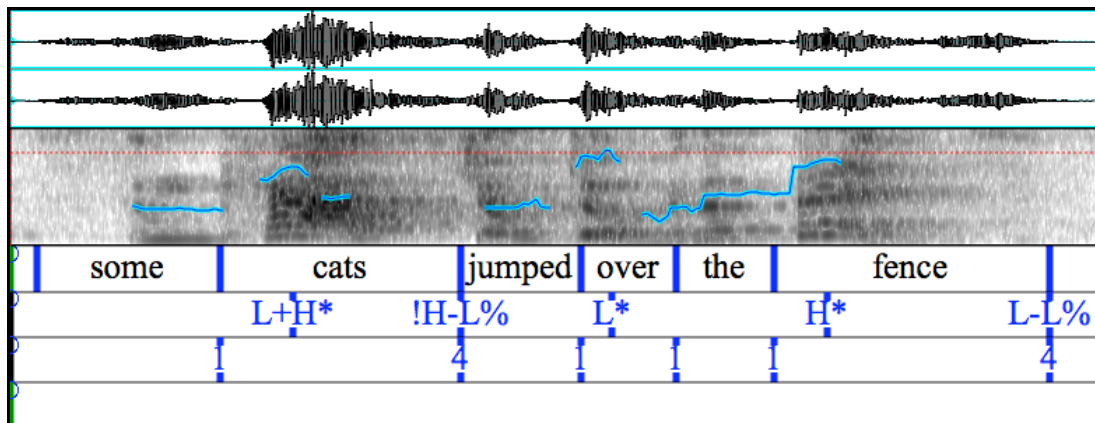
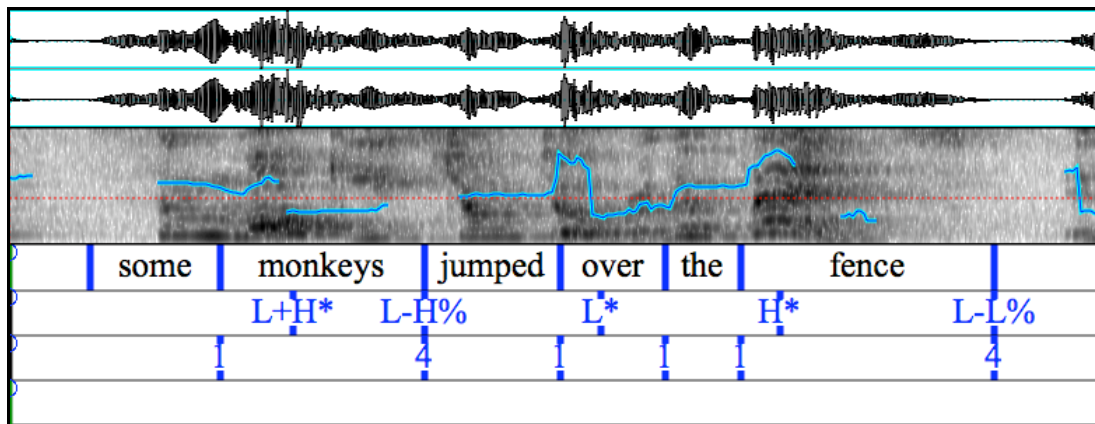
Vowel reduction appears to be important in the cancellation of implicatures, as *sm* allowed more implicature cancellation than deaccented *some* in both adults and children. Children especially seem to be aware of the importance of vowel reduction, as illustrated by the difference between *sm* and deaccented *some* in non-DE and DE context. To a certain extent, children seemed to be more sensitive to vowel reduction as a phonological marker than to pitch accent.

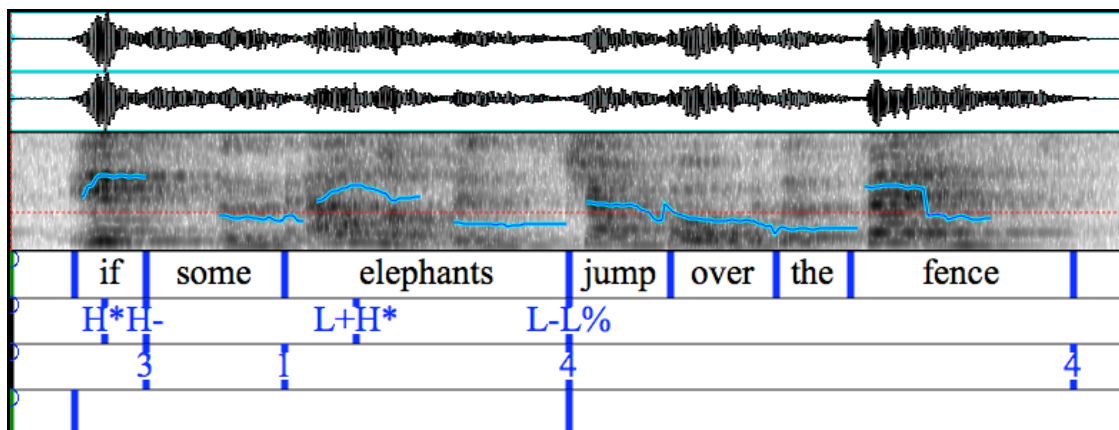
The presence/absence of a pitch accent appears to be crucial to implicature cancellation, as deaccented *some* allowed more implicature cancellation than pitch-accented SOME in both adults and children. Previous research has suggested that children tend to be more logical than adults, with a tendency to interpret "some" as "all" much more frequently than adults. This tendency was observed in this experiment. With respect to pitch accent, however, while children seemed willing to generate an implicature with pitch-accented SOME in DE context some of the time, they were less likely than adults to generate a pragmatic implicature with pitch-accented SOME in non-DE context ($\chi^2 = 23.2$ d.f. = 1 $p = .0001$).

It appears, then, that unlike Spanish, phonological properties play an essential role in the generation and cancellation of pragmatic implicatures. Additionally, when these phonological properties are systematically controlled, child English speakers are able to use those properties to generate and cancel pragmatic implicatures, although not always with the same frequency as adult English speakers. The results of this experiment also suggest that children as young as 4 can use prosodic, grammatical, and pragmatic context to generate and cancel pragmatic implicatures in an adult-like manner.

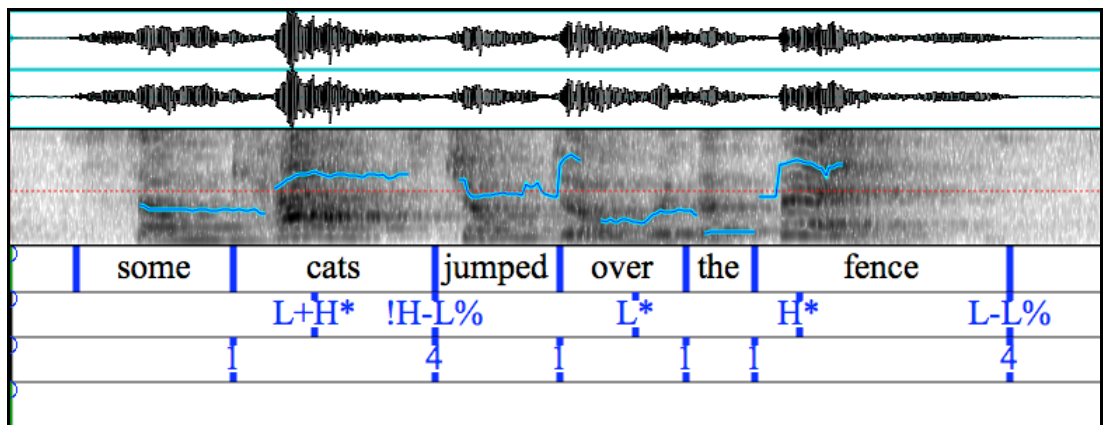
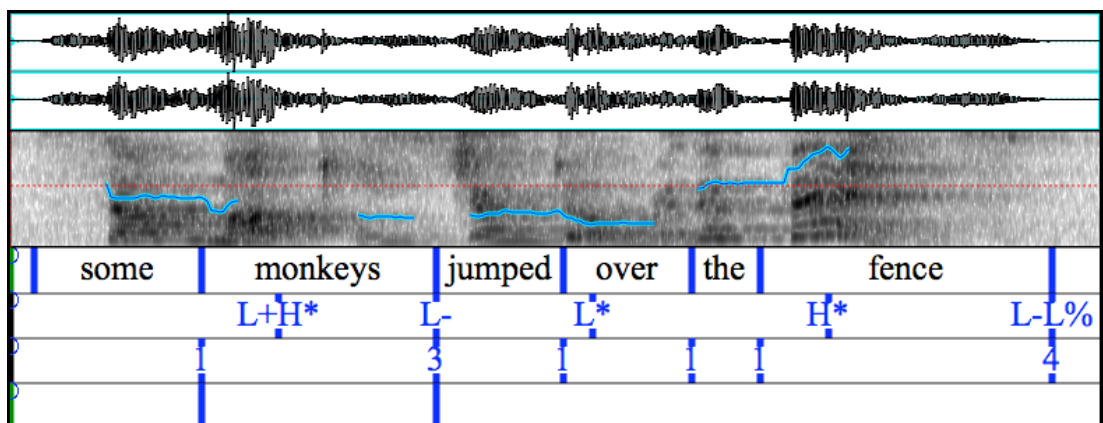
Appendix A

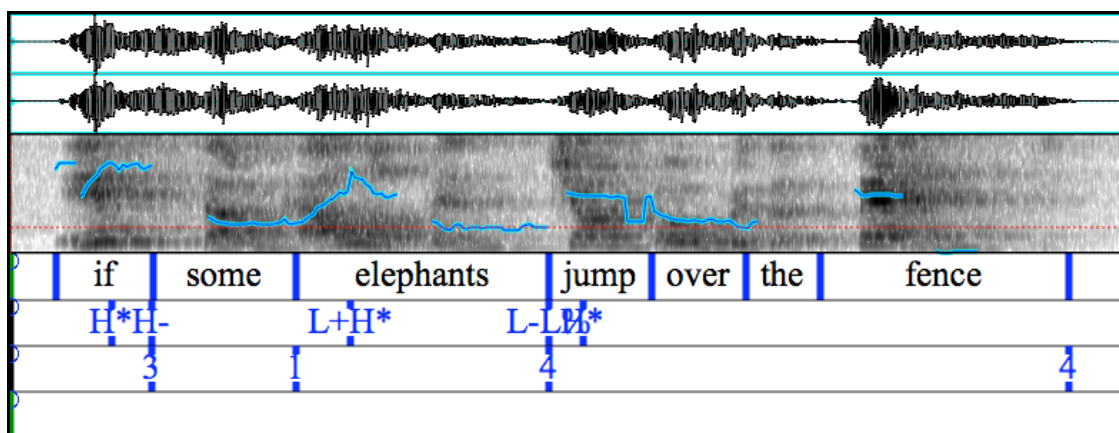
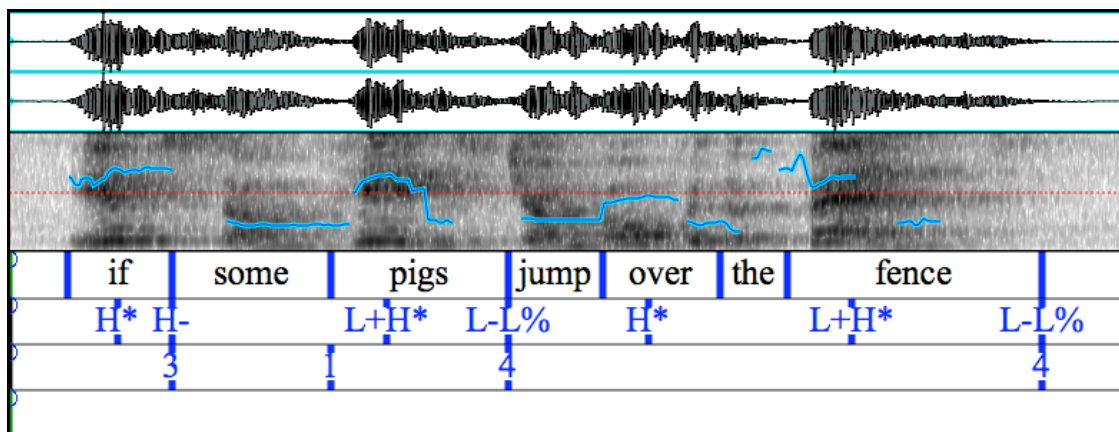
ToBi Transcription of Target Sentences: Sm



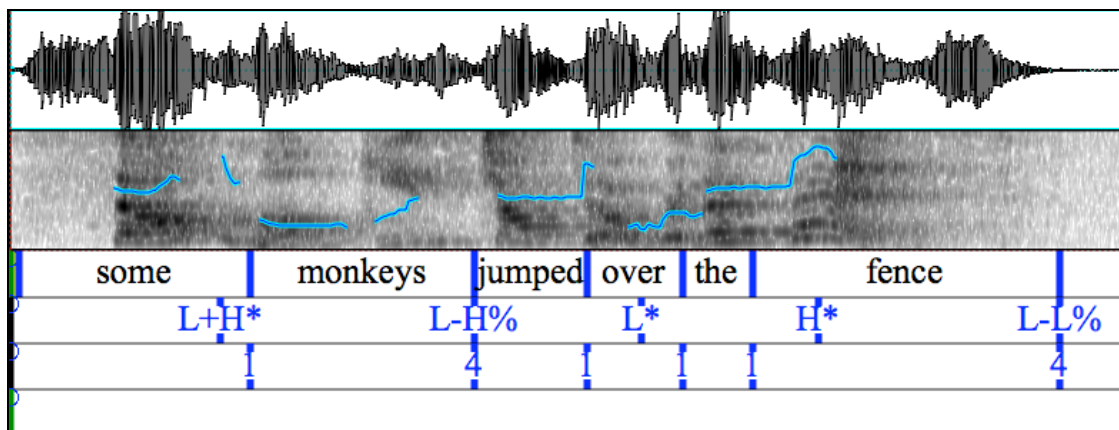


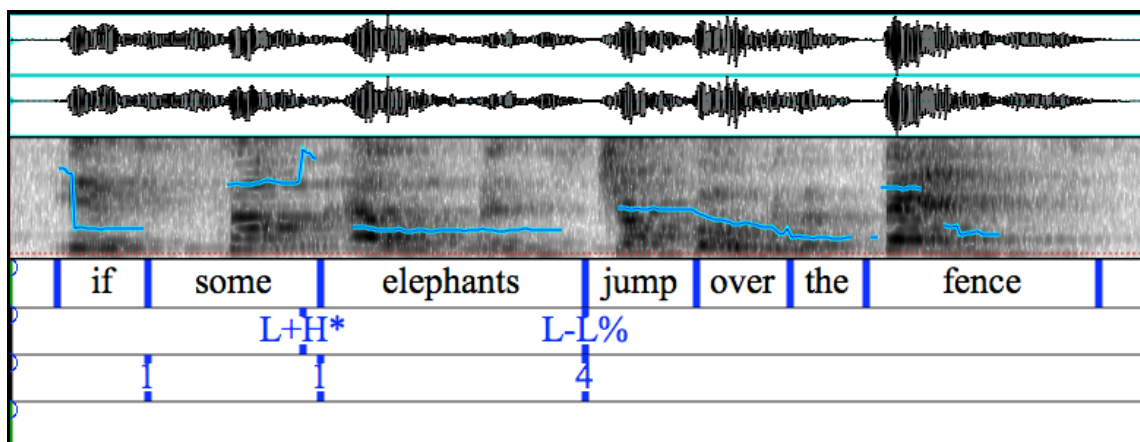
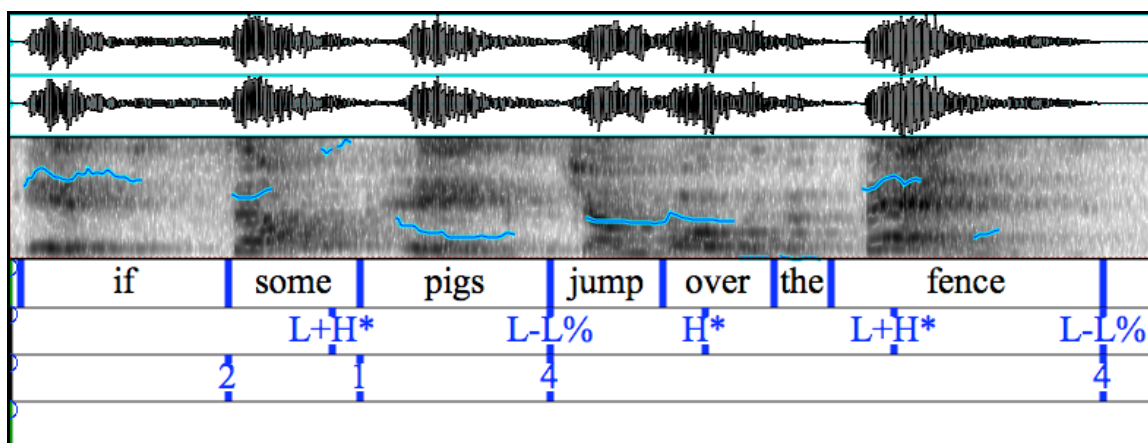
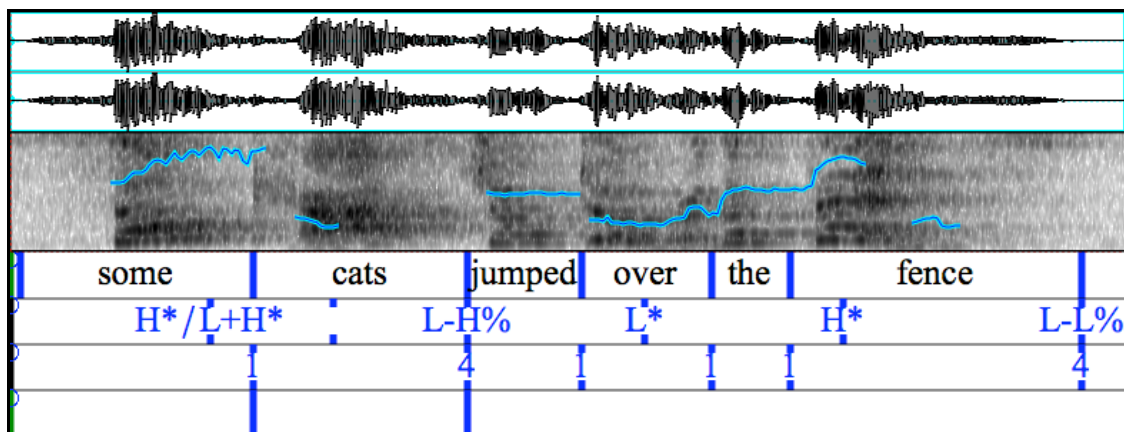
ToBi Transcription of Target Sentences: Some





ToBi Transcription of Target Sentences: SOME





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